



# Intergenerational effects of a green tax reform for a more sustainable social security system



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## ARTICLE INFO

Available online 4 September 2015

JEL classification:

F22

J61

O15

Keywords:

Environmental tax reforms

Pensions

General equilibrium

Intergenerational welfare effects

## ABSTRACT

Green tax reforms are popular in some circles not only because of their direct effect on reducing pollution but also because their revenue capacity may allow to reduce other more distortionary taxes. Despite their potential benefits, the political implementation of green tax reforms is not straightforward. Changes in environmental taxes have different intergenerational effects which need to be taken into account when considering their political support among a country's population. In this paper, we analyze the economic and intergenerational welfare effects of introducing a green tax reform to ameliorate the Spanish social security system. We consider two types of energy taxes: an energy-consumption tax and an energy input tax. We find that both types of reforms are favored by young individuals, but rejected by older generations. The number of generations supporting the reform depends crucially on the disutility that individuals derive from pollution, suggesting that an increase in environmental awareness may be needed for green tax reforms to be politically viable.

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## 1. Introduction

The severe recession experienced in some countries after the 2008 financial crisis forced their governments to seek new sources of funding to balance their budgets. In this context, several authors have called for increases in environmental taxes as a potential source of additional government revenue (see, for example, [Mirrlees, 2010](#)). Organizations such as the IMF, the OECD and the European Commission support this initiative (see, for example, [Cotarelli and Schaetcher, 2010](#); [OECD, 2010](#); [EC, 2010](#)). Increases in environmental taxes are favored not only because of their direct effect on reducing pollution, another important issue that governments are trying to address, but also because their revenue capacity may allow to reduce other more distortionary taxes.

Therefore, based on the double dividend hypothesis (see [Bovenberg and De Mooij, 1994](#)), the so-called green tax reforms represent a new instrument that allows governments to achieve not only environmental objectives (the first dividend or environmental dividend) but also fiscal efficiency (the second dividend or efficiency dividend). See [Bovenberg and Goulder, 2002](#) for a survey of the green tax reform literature.

The size and scope of environmental taxes vary considerably across developed countries, which implies that the potential effects of a

green tax reform are also different across countries. Spain, the focus of our study, is the EU country with the lowest share of environmental-related tax revenue relative to GDP (1.6 percent versus an average for the European Union of 2.4 percent, see [Eurostat, 2014](#)). Therefore, Spain is one of the countries with the largest scope for increasing environmental taxes, especially taxes related to energy products ([Alvarez et al., 2014](#)). Bringing Spanish environmental taxes at par to their levels in other European countries, would generate significant additional revenue that could be used to palliate other deficiencies like the funding of its pension system. To what extent these deficiencies could be solved by increasing environmental taxes is an important empirical question, which is addressed on this paper.

Even though green tax reforms may increase fiscal efficiency, their political implementation is not straightforward. Changes in environmental taxes have different intergenerational effects which need to be taken into account when considering their political support among a country's population.<sup>1</sup> [Bovenberg and Heijdra](#)

<sup>1</sup> There is a large literature that studies political implementation of environmental policies. See for instance, [Joskow and Schmalensee \(1998\)](#) and [Pearce \(2006\)](#). This literature emphasizes that the difficulties to implement potentially socially beneficial policies arise from the fact that governments often maximize a political welfare function (determined by influence groups and lobbies) instead of a social welfare function. In this paper we assume that political support is decided by simple majority rule among individuals who are alive in the period where the implementation of the tax is considered. Analyzing optimal mechanisms to politically implement these policies is outside the scope of this paper.

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(1998) find, in a context of overlapping generations' model, that the introduction of an environmental tax benefits the young and the unborn generations at the expense of the older generations. They conclude that this intergenerational trade off may complicate the introduction of these type of taxes. These authors, though, do not consider the effect of earmarking the environmental tax revenues to any specific program. In their paper, environmental tax revenues are just another source of general government funding.

Despite these potential difficulties, starting in the 1990s, several EU countries have managed to implement environmental tax reforms that increased taxes on some energy sources and used the revenues to reduce personal income taxes (Finland in 1990, Sweden in 1991 and Denmark in 1993), corporate taxes (the Netherlands in 1996 and 2001), or social security contributions (Germany in 1999, Norway in 1999, Italy in 1999, and the United Kingdom in 1996, 2001, 2002). A detailed description of these experiences can be found in [Hoerner and Bosquet \(2001\)](#).

In this paper, we analyze the economic and generational welfare effects of introducing a green tax reform in a dynamic general equilibrium framework of overlapping generations calibrated to the Spanish economy. We assume a complete population structure: individuals enter the economy at age 20, retire at age 65, and survive up to age 90. A period in our economy represents 5 years. Retirees receive a social security benefit (pension) which is funded through social security contributions on workers' labor income in a pay-as-you-go system. Both households and firms use energy, which is imported at (fixed) world prices, and that is taxed by the government. Based on empirical evidence, we treat energy used by consumer and energy used by firms as two different goods, so they can be taxed at different rates. In our economy pollution emissions are proportional to the use of energy by both firms and households. We assume that the aggregate stock of pollution affects consumers' utility negatively, but does not have any other effect in the economy.<sup>2</sup>

In this environment we study the effects of two revenue-neutral green tax reforms that increase taxes either on household energy consumption (scenario 1) or on energy used by firms (scenario 2), and reduces social security taxes while maintaining social security benefits and the Public Consumption/GDP ratio at their pre-existing levels. Our study is in line with [Habla and Roeder \(2013\)](#) who analyze the green tax reform carried out in Germany from 1999 to 2003, which introduced an ecotax, reduced social contributions, and maintained the level of pensions. Unlike these authors, who assume that generations live only

for two periods, we assume a complete population structure, which allows us to better analyze the intergenerational effects of reforms and to obtain short term quantitative results. Furthermore, we analyze the case of Spain.

We find that a green tax reform benefits younger generations that are alive in the period of reform, since they benefit the most from lower social security contributions, but hurts older generations. Furthermore, an increase in the household consumption tax benefits unborn generations, by increasing aggregate income, whereas an increase in the input tax reduces overall income and hurts unborn generations. Both reforms reduce emissions. The number of generations that benefit from the reform varies crucially with the weight that pollution has on the individuals' utility function, suggesting that environmental awareness campaigns can improve the political support for green tax reforms.

Our paper contributes to the literature that assesses the potential benefits of green tax reforms. Whilst this literature has stimulated the implementation of these reforms in some European countries (see [Bosquet, 2000](#)), the implementation barriers seem to be higher in Spain (see [Economics for Energy, 2013](#)). A few studies have estimated the potential impact of several green tax reforms (see, for example, [Labandeira et al., 2004, 2009](#)), but to the best of our knowledge our paper is the first to consider the intergenerational welfare effects of a green tax reform that is linked to the social security system. Our use of the overlapping generations' framework is in line with [Bovenberg and Heijdra \(1998, 2002\)](#) and [Chiroleu-Assouline and Fodha \(2006\)](#).

This paper also contributes to the literature on pension system reform by exploring a new alternative source of finance for the social security system. This is a novel aspect of our paper, since the literature that analyzes the sustainability of the pension system has traditionally focused on issues such as increasing the retirement age, reducing the retirement pension or increased contributions paid workers (see, for example, [Kitao, 2014](#), for a general reference). In particular, the debate about the reform of Law on the Sustainability of the Pension System launched in Spain in 2013 highlighted the need for additional sources of funding Spanish social security system. Our paper is a direct contribution to this debate by analyzing the effects of a green tax reform as a potential source of funding.

The paper is organized as follows. In [Section 2](#) we present the modeling framework. [Section 3](#), discusses the calibration of the parameters of the model. [Section 4](#) presents the results of the policy experiments on green tax reforms, and [Section 5](#) concludes.

## 2. The model

The economy is populated by overlapping generations of individuals who live no longer than  $N$  periods, competitive firms, and a public sector. The public sector consists of two differentiated institutions, each of them with its own fiscal instruments, and which are connected via transfers: the Government, which collects taxes and buys the domestically produced good, and the Social Security System, which collects social security contributions on workers' labor income and uses the proceeds to finance a pay-as-you-go social security system. We consider a quasi-small open economy framework where the economy imports two types of energy goods at exogenously given world prices: an energy consumption good ( $Z$ ) and an energy input ( $X$ ). We assume that these two energy goods are different because empirical evidence shows that the energy mix used by households and firms is different and, therefore, the final price and taxes of each mix are also different.

### 2.1. Demographics

Every period there are  $N$  generations alive, with ages denoted by  $i = 1, \dots, N$ . We assume that all individuals that belong to the same generation are identical; therefore the model focuses on intergenerational tradeoffs and abstracts from intragenerational redistribution. Let  $s_i$  denote the probability of surviving between age  $i$  and  $i + 1$ . All individuals who survive up to age  $N$  die with probability one, therefore  $s_N = 0$ . The unconditional probability of being alive at age  $i$  is given by  $s^i = \prod_{j=1}^i s_j$ , with  $s^1 = 1$ .

<sup>2</sup> This assumption is made for simplicity. In the real world, pollution may affect the economy through channels like workers' productivity, health or climate change. The extent to which adding these features to the model would affect the qualitative results depends on their relative impact across generations (see further discussion at the end of [Section 4](#)).

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